

## **Carton and Liner Assembly, and Method of Manufacture thereof**

This invention relates to a carton and liner assembly, and a method of manufacture thereof.

Although the following description makes almost exclusive reference to a carton and liner assembly in the form of a ready meal type tray and carton of the type which commonly contains perishable pre-cooked foods, such as curry or Chinese dishes, it will be appreciated by those skilled in the art that the carton and liner assembly of the present application has wider application. Indeed the ultimate contents of the assembly are irrelevant, but are ideally of a form which are required to be hot or require some level of heating prior to manual handling of the assembly being required.

There are currently a large number of cartons in use for the containment of food products. In cases where there is no requirement for heating of the foodstuff contained therein, a simple uncoated carton board carton may suffice. However, since carton board is generally hygroscopic, such cartons will deteriorate if a moist food product is contained therein for any length of time. In an effort to reduce this deterioration, carton manufacturers often use a polyethylene or polyethylene terephthalate (PET) coated board as this prevents the penetration of moisture into the structure of the board.

Alternatively, it is possible to provide a carton in the form of a board sleeve or open topped tray with a semi rigid plastics liner inserted therein. In this assembly, the semi-rigid liner prevents any contact between the foodstuff and the carton, thereby reducing or preventing deterioration of the carton board. However, the use of semi-rigid liner/carton assemblies have not been widely accepted

because of difficulties associated with automating the process of inserting a liner into an erected or punch-formed carton and thereafter ensuring that the liner is retained in the carton. The resulting assemblies are often expensive to manufacture and ensuring proper engagement of the inner liner and the outer carton is a time consuming process. The reader will appreciate the need for ensuring secure engagement of the inner liner with the outer carton, particularly as the inner liner component can often contain foodstuffs at temperatures approaching (and possibly even above) 100°C.

Conventional carton and liner assemblies for ready meals of the type for location in ovens or microwaves for heating or cooking the food product contained therein, typically comprise a simple thermoformed plastic tray, the open top of which is sealed with a suitable plastics film, whereafter the sealed tray is inserted inside a simple cardboard sleeve. In order for the food in the assembly to be cooked, the board sleeve is removed and the tray placed in the microwave or oven. On completion of the heating/cooking process, a user is typically required to manually handle the tray to extract the tray from the microwave/oven, to locate the food contents on a plate and/or to eat the food contents directly from the tray.

The plastic trays typically become hot after cooking and may result in burning of the user's hands during manual handling of the hot tray. This problem is exacerbated since many ready meals are now marketed for cooking by children or teenagers, such as chips or chicken nuggets, and children are less aware of the dangers associated with hot containers, thereby increasing the risk of burn injuries as a result of manually handling hot trays. In addition, when plastics trays becomes very hot, they typically lose their rigidity and become increasingly flexible, thereby causing the tray to droop, which can result in the contents of the tray spilling out of the tray if

the tray is not supported sufficiently at all four corners thereof. Spillage of hot food onto a user can increase the risk of injury to the user caused by burning and also results in wastage of the food product.

Furthermore, the cooking instructions of the food product are typically provided on the sleeve which is required to be removed prior to cooking. Removal of the sleeve is a time consuming process which adds to the complexity of the cooking process. In addition, separation of the cooking instructions from the food product may result in the user not having the instructions to hand when handling the product and/or the sleeve instructions might be accidentally thrown away before or during the cooking process, thereby resulting in the user carrying out incorrect cooking or heating procedures on the food.

It is therefore an object of the present invention to provide a carton and liner assembly which provides some degree of insulation following heating to allow easy and safe handling of the assembly when hot, and which provides increased rigidity to the liner to prevent spillage of one or more products container therein.

It is a further object of the invention to provide a carton and liner assembly which allows secure engagement between the carton and liner and which allows efficient nesting of either or both components.

It is a yet further object of the invention to provide a method of manufacturing a carton and liner assembly which is inexpensive and which allows rapid securement of the assembly together.

According to a first aspect of the present invention there is provided a carton and liner assembly, said assembly including an

open topped carton erected from a carton blank and a liner, each of said liner and said carton having side walls and a base defining an internal cavity, said liner located in the internal cavity of said carton when assembled and said liner having a rim on one or more uppermost edges of said side walls which engages with at least a part of one or more of the side walls of said carton and characterised in that the carton is secured to the liner by means of adhesive applied to the base and/or side walls of the liner and/or carton.

The advantages of the present invention are that the liner and carton can be quickly and easily adhered together, thereby providing secure engagement between the same. Since the liner remains attached to the carton prior to the location of one or more food products in the liner and during the cooking or heating procedure for the food, the carton provides the liner with increased strength and rigidity, thereby preventing, or at least reducing, spillage of food from the liner and carton assembly as a result of the liner becoming flexible and drooping when hot.

Both the liner and carton are typically formed from lightweight materials which provide the required rigidity to the assembly in combination when adhered together, without the requirement for use of expensive materials and procedures associated with the manufacture of known carton and liner assemblies. In addition, there is no requirement for a user to remove an outer sleeve or carton prior to heating or cooking of a food product container in the assembly, thereby increasing the ease with which the food product can be cooked or heated. As such, the carton/liner assembly of the present invention is ideally suited for food products which may be heated or cooked by children or teenagers. Since information relating to the food product contained in the carton/liner assembly is typically printed on an outer surface of the

carton, such as the cooking instructions, nutritional content, appearance of the food and/or the like, the user will also be able to easily refer to the information at all times when handling the food product.

Preferably the liner is formed from a plastics material, either solid or foamed, but any other material capable of retaining moist food products and the like therein for an indefinite period of time without substantial degradation of the material can be used.

Further preferably this plastics material is in the form of a foamed plastics material, such as crystalline PET (CPET). The foamed plastics material provides the carton and liner assembly with the desired insulation properties required if the assembly becomes hot or is heated, thereby allowing manual handling of the assembly without the risk, or at least a reduced risk of the user being injured or burnt. Use of CPET allows the carton and liner assembly to be used in oven and microwave cooking applications. Thus, the combination of the liner and carton and the formation of the liner from CPET provides the assembly with significantly enhanced insulating properties.

The CPET can also be provided in a solid or non-foamed form if required.

Preferably the carton is formed from board material.

Preferably the carton and/or liner are provided in the form of a tray shaped receptacle which is typically lidless or open topped. The base of the carton and/or liner is typically of a larger surface area than the side walls and/or the liner can be of a reduced thickness compared to known CPET liners. These changes have not previously been possible with known CPET liners due to the

problems of drooping and increased flexibility of the same on heating, thereby conventionally requiring the side walls and/or end walls of the liner to be of a greater surface area than the base and/or the liners to be formed from relatively thick CPET material. The requirement for thick CPET liners to be used and the limitations of the shape of conventional CPET liners have been overcome in the present invention by providing increased strength and rigidity to the assembly by using the carton in combination with the liner, thereby allowing a larger range of containers/tray shapes to be provided.

The carton and liner are each separately and in combination adapted for nesting a plurality of the same together, one within another.

Preferably the base of the liner is substantially planar to allow mutual cooperation with a substantially planar base of the carton.

In one embodiment both the liner and the carton are provided with radiused corners where the respective side walls meet and where the edges which define the respective bases meet.

The term radiused can also cover any suitable arcuate or curved shape.

The outer surface of the liner and/or the inner surface of the carton can be provided with substantially planar side walls or, alternatively, the same can be provided with one or more rib members thereon.

Preferably the adhesive used to secure the carton and the liner together is food safe and can operate over at least a temperature range of -40 to +220 degrees Centigrade.

In one embodiment the rim of the liner along an upper edge thereof overlies one or more of the uppermost edges of the side walls of the carton, thereby allowing engagement between the carton and the liner.

In an alternative embodiment a clip arrangement is provided for engagement of the carton and liner adjacent upper edges thereof. If required, this clip arrangement could be used as an alternative to the use of adhesive between the carton and liner, thereby providing the required rigidity and strength to the assembly whilst minimising the cost associated with the materials used to achieve said required rigidity and strength. This can be a separate and independent aspect of the present invention.

Preferably the clip arrangement includes a channel shaped member being provided or formed on the rim of the liner. An uppermost edge of the carton engages in the channel of said channel shaped member. The upper most edge of the carton is typically provided with a flexible, outwardly extending flange portion which allows location in said channel by flexing inwardly against the outer wall of the carton. Movement of the flange in an outwardly direction from the carton when located in the channel prevents or restricts movement of the flange from the channel.

The channel shaped member typically faces the outer surface of the liner in use and can be formed, for example, by turning or curling the upper edge of the liner in a direction outwardly and downwardly of the liner.

According to a further aspect of the present invention there is provided a method of manufacturing a carton and liner assembly, said assembly including an open topped carton erected from a carton blank and a liner, each of said liner and said carton having

side walls and a base defining an internal cavity, said method including the steps of depositing adhesive on the base and/or side walls of the carton and/or liner and subsequently bringing the liner and carton together such that when the carton and liner are assembled, the liner is located in the internal cavity of said carton and a rim on one or more uppermost edges of said side walls of said liner engages with at least a part of one or more of the side walls of said carton.

In one embodiment the liner is deposited in the cavity of the carton whilst the adhesive is still wet. The carton can be erected, assembled and adhered to the liner at a first location or the carton can be erected at a first location and delivered to a second remote location separately to the liner for subsequent assembly and adherence with the liner. In the latter case, the cartons and liners are typically nested separately prior to assembly.

In this embodiment the adhesive may be applied to the base and/or side wall of the carton and/or liner.

Preferably once assembled, the carton and liner are then moved, lifted or lowered from the point of assembly and deposited in a nest. The wet adhesive is sufficiently adhesive prior to drying to ensure that the carton is moved together with the liner, whereafter the adhesive dries to form a secure bond between the respective bases and/or side walls of the liner and carton. For example, the adhesive may not be required to have the same degree of adhesiveness if the assembly is nested in a stack by lowering the assembly rather than lifting the assembly onto the stack.

In an alternative embodiment the liner is brought into engagement with the carton after the adhesive has dried. In this embodiment the adhesive has self adhesive properties when in a dried condition (i.e.,



maintains its adhesive qualities for a predetermined period of time after application). The cartons and/or liners are shaped so as to provide a pre-determined space between a first carton or liner base and the base of a further carton or liner nested therein, thereby allowing adhesive applied to a base of the first carton to dry without adhering to the underside base surface of a nested carton. In this embodiment, a stack of nested cartons can have adhesive applied thereto and can be delivered to an assembly location for assembly with corresponding liners without the requirement for adhesive to be supplied at the assembly location. For example, the side walls of the carton and/or liner can be tapered outwardly from the base to the uppermost edges thereof to limit the movement of the liner in the carton or the nested cartons or liners relative to each other.

In providing a separate inner liner for location in an outer carton in accordance with the present invention, the liner can be inserted into the carton and the two components can be adhered together in a region of their mutually contacting bases in a single motion. This greatly increases the speed of the assembly process and therefore reduces the cost of the same.

In one embodiment, one or more flaps are provided on the carton to act as a shelf or ledge to limit the movement of a further carton as it is received in the carton in a nesting assembly. The flaps can be provided on the internal or external surfaces of the carton to protrude inwardly or outwardly respectively as required.

Preferably a substantial portion of the walls of adjacent nested cartons or liners are in contact with one another and the bases of the cartons or liners are separated by a distance greater than the thickness or height of adhesive applied to the lower carton or liner base.

In an alternative embodiment the carton is constructed by adhering side wall panels thereof to flaps provided on adjacent side walls and which are disposed internally of the carton. Each of the flaps is deformed by a debossing, embossing or similar step such that on erection, protrusions or ledges are defined internally of the erected carton structure to prevent the base of a carton received within the cavity of another carton from coming into contact with the base thereof. This is conventionally known as "lock erecting".

Preferably the carton is erected into a tray-shape from the simple blank as a separate step in the method process. The carton can be formed in a required shape and the liner is typically complementary in shape thereto.

Most preferably the carton is initially flat in the form of a simple blank and subsequently erected into its carton shape using a punch and die, respective side walls being adhered to one another on the inside of one or both pairs of the side walls by means of extension flaps which extend around the side corners of the carton, and typically also underneath the respective adjacent side walls. Other conventional means of forming the carton can also be used, such as the use of flaps on a side wall for location in corresponding apertures on an adjacent side wall.

The formed carton can be provided in a conventional infolded or outfolded form by folding along one or more fold lines of the formed carton. As such, the carton can be moved from a folded condition to an erect condition using a forming tool or by hand. For example, diagonal creases can be included in the formed carton to allow easy manipulation of the same from a folded to an erect condition.

It is yet further preferable that between the side walls and extension flaps there is provided an arcuately shaped panel, optionally provided with a series of lines of weakness extending radially away from the inner curved edge to the outer curved edge.

Most preferably, the erection of the carton results in a conventional carton with four upwardly inclined corners, but the subsequent insertion of the liner thereinto constrains these corners to conform to the radiused upwardly inclined corners of the liner, most preferably by virtue of the lines of weakness provided in the arcuately shaped panels.

Most preferably the base panel of the carton blank is provided with radiused corners and corresponds in size to the radiused corners of the liner which is ultimately inserted into the subsequently erected carton.

It will be appreciated from the above that the completed assembly can be provided to customers and users in its completed condition or the liner and carton can be provided to the customer separately prior to completing assembly. The rim of the liner can also be used for the application of any conventional board or plastics lid to effectively seal the liner and its contents from ambient conditions and for transport.

When creating a nest stack, the base of a carton can be located in the cavity of a liner, adhesive can be applied to the internal base and/or side walls of the carton and/or outer side walls and/or base of a further liner and the further liner can then be located in the internal cavity of the carton for engagement. This cycle can be repeated until a completed nested stack is achieved sufficient to either complete the drying of the adhesive or until the stack is moved into a further station or container. For example, the stack

can be moved to a transit container for delivery to the point of use for filling of individual liner/carton assemblies with food or one or more other articles. During this time, pressure can be applied to the stack to ensure intimate contact of all carton/liner assemblies until at least such time as the adhesive located in said assemblies is dry.

According to a yet further aspect of the present invention there is provided a method of manufacturing an assembly as described above wherein the method includes the steps of depositing wet adhesive on the base and/or side walls of a carton and/or liner, bringing together the liner and carton together so that the liner is located in an internal cavity of said carton, optionally applying pressure onto said liner base, followed by the step of moving the liner and depositing the same in a nest, the wet adhesive being sufficiently adhesive before drying to ensure that the carton is moved together with the liner when the assembly is deposited in said nest, whereafter said adhesive dries to form a secure bond between the respective bases and/or side walls of the liner and carton.

Separation of the carton and liner assembly for disposal or otherwise can be undertaken by forcing the two components apart to release the adhesive bond. Further features, such as weak or frangible portions on the carton, pull tabs and/or the like can be provided to increase the ease by which the assembly can be separated.

Embodiments of the present invention will now be described by way of example with reference to the following drawings wherein:

Figure 1 shows a plan view of a simple carton blank for use according to one embodiment of the present invention;

Figure 2 shows a perspective view of the blank of Figure 1 in its erected condition, and a simple tray shaped liner thereabove for deposition within the erected carton;

Figure 3 shows a plan view of a simple carton blank for use according to a further embodiment of the present invention;

Figure 4 shows a perspective view of a carton erected from the blank of figure 3;

Figure 5 shows a perspective view of two cartons according to figure 3 shown in a nested relationship;

Figure 6 shows a yet further example of a carton according to the present invention; and

Figure 7 is an enlarged cross sectional view of a clip arrangement for use in the assembly of the present invention.

Referring firstly to Figure 1 there is shown a carton blank 2 having a base panel 4 and respective side wall panels 6, 8, 10, 12 foldably secured along the edges of the base panel 4. On the extremities of the side wall panels 6, 10 there are provided arcuately shaped panels 6A, 6B, 10A, 10B, foldably connected to said side panels 6, 10, and said arcuately shaped panels terminate in extension flaps 7A, 7B, 11A, 11B respectively.

It is to be noted that the corners of the base panel 4 are radiused or curved as shown at 4A, 4B, 4C, 4D, and during the punch and die style erection of such a carton, if such an erection method is used, side walls 6 and 10 of the carton are progressively upwardly and outwardly inclined from the base and the arcuately shaped panels, 6A, 6B, 10A, 10B are conformed around the interior surfaces of the

die so that the extension panels 7A, 7B, 11A, 11B are disposed to the inside of the side wall panels 8, 12. During the erection process, adhesive is applied either to the side wall panels 8, 12 in the region of their extremities, or to the outer surfaces of the extension panels 7A, 7B, 11A, 11B to enable the carton to retain its erected shape by virtue the adhesion of the extension panels 7A, 7B, 11A, 11B to the inner surfaces of the side wall panels 8, 12 as shown in Figure 2.

In accordance with the invention, after the erection of the carton blank shown in Figure 1 as previously described, a simple open topped carton 20 is provided into which portions of wet adhesive 22, 24 are provided substantially on the base panel 4, but possibly, and not detrimentally, such adhesive may transgress the boundary edges on either side of the base panel 4 such that there may be small amounts of the wet adhesive applied to the side wall panels 6, 10. After the application of the adhesive, a simple tray shaped foamed plastics liner 26 having a base panel 28 and side wall panels 30, 32, 34, 36 may be pressuredly deposited in the open topped carton 20 such that its base panel 28 is adhered to the correspondingly shaped and sized base panel 4 of the carton. The resulting carton and liner assembly is one which provides at least some degree of insulation between the outer surfaces of the side walls 30, 32, 34, 36 of the liner and the inner surfaces of the side walls 6, 8, 10, 12 of the carton on the one hand because of the insulating properties of the foamed plastic material used for the liner construction, and on the other hand because to a substantial extent, the side walls of the carton 6, 8, 10, 12 are not adhered to the outer surfaces of the side walls 30, 32, 34, 36 of the inner shaped liner.

Furthermore, it is to be noted that the corners of the base panel 28 of the liner are radiused as indicated at 28A, 28B, 28C, 28D, as are the corners of the liner where the side walls meet, and it is these

radiused corners of the liner which constrain the arcuately shaped panels 6A, 6B, 10A, 10B to adopt a similarly radiused configuration, notwithstanding that the punch and die erection process may initially have provided these arcuately shaped panels with generally sharp corners. It is to be noted from Figures 1 and 2 that each of the arcuately shaped panels 6A, 6B, 10A, 10B is provided with a plurality of score or crease lines which provide these arcuately shaped panels with lines of weakness and enable them to adopt the radiused configuration hereinbefore described. These lines of weakness are indicated generally in the figures by reference numeral 30.

The resulting carton and liner assembly provides increased strength and rigidity compared to use of either the carton or liner separately. The combination of the carton and liner allows the assembly to be provided in a tray form, where the base is of substantially larger surface area than the side or end walls, without drooping of the liner following heating.

Referring to figures 3-5, there is illustrated a further example of a carton erected from a blank that can be used for assembly with a correspondingly shaped liner in accordance with the present invention.

The carton blank 102 shown in figure 3 can be erected to form a conventional bellows style carton as shown in figure 4. The blank has side wall panels 104, 106, 108 and 110 foldingly connected to a base 112. Intermediate panel pairs 104''-106', 106''-108', 108''-110' and 110''-104' respectively are foldingly connected together and to respective side wall panels 104, 106, 108, 110. The intermediate panel pairs can be folded inwardly or outwardly for adherence or attachment via other conventional attachment means to the corresponding side wall panels.

In one embodiment, during the manufacture of the carton blank 102, a layer of adhesive 114 is applied to the side of the base panel which after erection of the carton forms the internal base of the carton. Alternatively, the adhesive can be applied to the internal base of the carton once the carton has been erected, as shown in figure 4.

The erected carton 120 has an open end 122 and a closed end formed by base 112. A correspondingly shaped liner (not shown) is inserted into the carton via open end 122 in a similar manner to that described above.

The liner can be provided with a flange along an upper peripheral edge (of the type shown by reference numeral 27 in figure 2) which can cooperate with upper peripheral edge 123 of carton 120. The upper peripheral edge 123 of carton 120 can also be provided with a seat or flange (not shown) on which the flange of the liner can locate.

The erected carton 120 is formed such that the dimensions of the base are smaller than the dimensions of the upper peripheral edge thereof. As such, when two cartons are seated together (the base of one carton is located in the open top of a further carton) in a nest 130, as shown in figure 5, a space of pre-determined distance 132 is provided between the base 112 of one carton 120a and the underside surface of base 112' of a further carton 120b. This space allows wet adhesive to be applied to the base 112 of carton 120a either during or after erection of the carton and dried without adhering to the underside surface of base 112'. This is of particular advantage since it allows cartons to be erected, adhesive applied thereto and nested at a first location and then transported to a



further location and/or stored for a pre-determined period of time prior to assembling a liner with each carton.

The bellows type construction of the cartons, wherein bellows formed from the intermediate panel pairs are provided on the outside of the respective pair of opposite side walls, significantly increases the thickness of the side walls, thereby also limiting the extent to which one carton can be nested in another to ensure a space is left between the bases of the cartons.

In a further alternative means, one or more flaps can be provided on the carton which protrude inwardly of the carton interior at a required location. The flaps act to limit movement of a further carton being nested therein. The flaps can be formed from appropriately formed cuts made in the carton blank. Flaps can also be provided which protrude outwardly of the carton and which cooperate with the interior surface of a further carton into which it is located, thereby limiting movement thereof.

The adhesive can be applied to the side walls of the carton in addition to the base. However, an advantage of applying adhesive to the base of the carton is that, if a punch and die is used to form the blank, the adhesive can be pre-applied substantially in the centre of the blank prior to it being fed into the punching apparatus. The punch can be provided with a cavity in its central region so that it performs the punching operation on the majority of the blank without any contact between the punch and the adhesively coated area(s) of the blank. In addition, it allows nesting of the carton without adherence of adjacent nested cartons with one another.

The layer of adhesive can be indiscriminately applied but it can also be applied in a pre-determined pattern. Indeed, this is desirable

where the area in contact with the liner base is typically of a particular shape, such as circular.

The adhesive is typically of a type which does not cure or set immediately after application and which retains its adhesive qualities for a period of at least 6-8 weeks. The adhesive is also of a type which can be used without representing a safety hazard to food which is subsequently located in the carton/liner assembly.

A further example of a carton 200 for use with the present invention is shown in figure 6. The carton 200 comprises a base 202 from which four side wall panels 204, 206, 208 and 210 extend in an upwardly direction. The side wall panels are held in position by means of adhesion flaps 204A, 204B, 208A, 208B which are adhered to the inside of panels 206, 210.

A plurality of lines of weakness 212 are provided in the blank which are creased, folded or otherwise and are in addition to the fold lines of the blank between the adhesion flaps and the side wall panels. The reason for the provision of these lines of weakness is to allow the corners of the carton to relax slightly as a liner (not shown), which is typically curved around its corners is inserted into the carton, the corners becoming curved or radiused in the process. In this manner the corners of the carton may conform to the curved corners of the liner to achieve a snug fit.

Adhesive can be applied to base 202 of the carton to secure the liner thereto in the normal manner.

A further feature of the carton shown in figure 6 is the raised lips 204C, 206C, 208C and 210C which are provided on the upper edge of the side wall panels. The lips restrict the downward movement of a liner into the carton as they abut underneath a flange provided on

the upper peripheral edge of the liner. The raised lips terminate in the regions of the corners to form a plurality of notches to allow for the slightly enlarged moulding features which are prevalent in the liner at the corners proximate the flange. The notches also prevent de-nesting of the cartons when stacked.

Referring to figure 7, there is illustrated a detailed cross sectional view of a clip arrangement 302 for use in the present invention. The upper most edge portion of the liner 304 is provided with a channel shaped formation 306 defining a recess or channel 308 therein. The upper most edge of the carton 312 is provided with a substantially flexible flange portion 310. In order to engage the carton with the liner assembly via the clip arrangement, the uppermost edge 314 of the carton is located between the gap 316 formed between the free end 318 of the channel formation 306 and the outer liner wall 304. This causes flange portion 310 to flex inwardly against the surface of carton 312. On location of flange portion 310 in the channel 308, the flange flexes outwardly and prevents removal of the same from the channel unless excessive force is used.

The invention of the present invention is particularly, although not necessarily exclusively suitable for use in ovens and microwaves.